

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A radio frequency transponder, comprising:
an antenna for receiving an interrogation signal;
a memory that stores an information code; and
a phase modulator comprising:
a switch having a control terminal and first and second conduction terminals, the first conduction terminal being coupled to the antenna;
a stub ^A [having a length other than a wavelength of the interrogation signal and being coupled to the second conduction terminal of the switch; and
a driver coupled between the memory and the control terminal of the switch, ⁽⁴³⁾¹⁹
wherein the transponder is configured to return a backscatter response of a substantially constant power level.

2. (Previously Presented) The transponder of claim 1 wherein the stub is a quarter-wavelength stub.

3. (Previously Presented) The transponder of claim 1 wherein the driver includes a microprocessor.

4. (Currently Amended) A radio frequency transponder, comprising: ²⁰¹
an antenna for receiving an interrogation signal;
a memory that stores an information code; and
a phase modulator having a diode, a first terminal of the diode coupled to the antenna and a driver coupled between the memory and a second terminal of the diode, the driver being structured to produce a modulating signal corresponding to the information code, the

modulating signal ~~being~~ comprising a variable voltage that modulates a capacitance of the diode to phase modulate the interrogation signal and thereby produce ~~the~~ a response signal having a substantially constant power level.

5. (Original) The transponder of claim 4 wherein the driver includes a microprocessor.

6. (Currently Amended) A radio frequency transponder, comprising:
an antenna to receive an interrogation signal;
a memory to store an information code; and
a phase modulator having:
a first diode having first and second ends, the second end ~~being~~ coupled to the antenna;
a second diode having first and second ends, the first end ~~being~~ coupled to the antenna and the second end of the first diode;
a stub ~~being~~ coupled to the second end of the second diode;
a parallel RC circuit coupled between the stub and a reference voltage; and
a driver coupled between the memory and the first end of the first diode, the driver ~~being~~ structured to produce a modulating signal corresponding to the information code, the transponder configured to return a backscatter response signal having a substantially constant power level.


7. (Currently Amended) A radio frequency transponder, comprising:
an antenna to receive an interrogation signal;
a memory that stores an information code; and
a phase modulator structured to produce a response signal having a substantially constant power level according to the information code, the response signal containing a plurality of phases in addition to a phase that is substantially identical to a phase of the interrogation signal.

8. (Previously Presented) The transponder of claim 7 wherein the phase modulator includes first and second phase changers that produce in the response signal respective first and second phases that are each different than a phase of the interrogation signal.

9. (Currently Amended) The transponder of claim 8 wherein the phase modulator further includes a third phase changer that produces in the response signal a third phase that is different than the phase of the interrogation signal, each of the phase changers ~~include~~ including a switch coupled between the antenna and a stub ~~[having a length other than a wavelength of the interrogation signal]~~.

10. (Currently Amended) A radio frequency communication system, comprising:

an interrogator that transmits a radio frequency interrogation signal and receives a backscatter response signal; and

 a transponder that receives the interrogation signal and ~~transmits~~ returns the backscatter response signal to the interrogator, the response signal having a substantially constant power level, the transponder comprising:

an antenna;

a memory that stores an information code; and

a phase modulator coupled to the memory, the phase modulator comprising:

a stub ~~[having a length other than a wavelength of the interrogation signal]~~

a switch coupled between the stub and the antenna and having a control terminal;

a driver coupled between the memory and the control terminal of the switch, the driver ~~being~~ structured to produce a modulating signal corresponding to the information code, the modulating signal alternately opening and closing the switch.

11. (Previously Presented) The communication system of claim 10 wherein the stub comprises a quarter-wavelength stub.

12. (Currently Amended) A radio frequency communication system, comprising:

an interrogator to transmit a radio frequency interrogation signal and to receive a backscatter response signal;

a transponder configured to return a response signal having a substantially constant power level, the transponder including:

a memory that stores an information code;

an antenna to receive the interrogation signal and to transmit the response signal;

and

a phase modulator coupled to the memory and structured to produce the response signal by phase modulating the interrogation signal according to the information code, the phase modulator including a diode coupled at a first end to the antenna and a driver coupled between the memory and a second end of the diode, the driver ~~being~~ structured to produce a modulating signal corresponding to the information code, the modulating signal ~~being comprising~~ a variable voltage that modulates an impedance of the diode to phase modulate the interrogation signal and thereby produce the response signal.

13. (Currently Amended) A radio frequency communications system, comprising:

an interrogator to transmit a radio frequency interrogation signal and to receive a backscatter response signal; and

a transponder to return a phase-modulated response signal having a substantially constant power level, the transponder comprising:

an antenna to receive the interrogation signal and to transmit the response signal;

a first diode having an anode and a cathode, the cathode of the first diode ~~being~~ coupled to the antenna;

a second diode having an anode and a cathode, the anode of the second diode ~~being~~ coupled to the antenna and to the cathode of the of the first diode;
a quarter-wavelength stub coupled to the cathode of the second diode;
a parallel RC circuit coupled between the stub and a reference voltage; and
a driver coupled between the memory and the anode of the first diode, the driver ~~being~~ structured to produce a modulating signal corresponding to the information code.

14. (Currently Amended) A radio frequency communication system, comprising:

an interrogator to transmit a radio frequency interrogation signal; and
a transponder to receive the interrogation signal and to ~~transmit~~ return a response signal having a substantially constant power level, the transponder comprising:

a memory that stores an information code; and
a phase modulator structured to include in the response signal a plurality of phases in addition to a phase that is substantially identical to a phase of the interrogation signal.

15. (Previously Presented) The communication system of claim 14 wherein the phase modulator includes first and second phase changers that produce in the response signal respective first and second phases that are each different than a phase of the interrogation signal.

16. (Currently Amended) The communication system of claim 15 wherein the transponder includes an antenna that receives the interrogation signal and ~~transmits~~ returns the response signal and the phase modulator further includes a third phase changer that produces in the response signal a third phase that is different than the phase of the interrogation signal, each of the phase changers include a switch coupled between the antenna and a stub ~~having a length other than a wavelength of the interrogation signal~~.

17. (Currently Amended) A radio frequency transponder, comprising:
means for receiving a radio frequency interrogation signal from an interrogator;

means for phase modulating the interrogation signal according to an information code to produce a response signal having a substantially constant power level; and

means for ~~transmitting~~ returning the response signal, wherein the phase modulating means includes:

stub means ~~[having a length other than a wavelength of the interrogation signal]~~;

signal producing means for producing a modulating signal corresponding to the information code; and

switching means coupled to the stub means and responsive to the modulating signal.

18. (Previously Presented) The transponder of claim 17 wherein the stub means ~~[having a length other than a wavelength of the interrogation signal]~~ is a quarter-wavelength stub.

19. (Currently Amended) The transponder of claim 17 wherein the signal producing means include a memory that stores the information code and processing means coupled to the memory, the processing means ~~being~~ for producing the modulating signal as a function of the information code.


20. (Currently Amended) A radio frequency transponder, comprising:
means for receiving a radio frequency interrogation signal from an interrogator;
means for phase modulating the interrogation signal according to an information code to produce a response signal having a substantially constant power level; and

means for ~~transmitting~~ returning the response signal, wherein the phase modulating means ~~include~~ includes driver means for producing and applying to a ~~diode~~ variable impedance means a modulating signal corresponding to the information code, the modulating signal ~~being~~ comprising a variable voltage that modulates an impedance of the ~~diode~~ variable impedance means to phase modulate the interrogation signal and thereby produce the response

signal, the ~~diode~~variable impedance means ~~being~~ coupled between the driver means and the means for transmitting the response signal.

21. (Currently Amended) The transponder of claim 20 wherein the signal producing means include a memory that stores the information code and processing means coupled to the memory, the processing means ~~being~~ for producing the modulating signal as a function of the information code.

22. (Currently Amended) The transponder of claim 20 wherein the ~~diode~~variable impedance means ~~include~~comprises:

 a first diode coupled to the transmitting means;
a second diode coupled to the transmitting means and the first diode;
a quarter-wavelength stub coupled to the second diode;
a parallel RC circuit coupled between the stub and a reference voltage; and
a driver means coupled to the first diode, the driver means ~~being~~ for producing and applying to the first diode a modulating signal corresponding to the information code.

23. (Currently Amended) A radio frequency transponder, comprising:
means for receiving a radio frequency interrogation signal from an interrogator;
means for phase modulating the interrogation signal according to an information code to produce a response signal having a substantially constant power level; and
means for ~~transmitting~~ returning the response signal, wherein the phase modulating means include first and second phase changers that produce in the response signal respective first and second phases that are each different than a phase of the interrogation signal.

24. (Original) The transponder of claim 23 wherein the phase modulating means further include a third phase changer that produces in the response signal a third phase that is different than the phase of the interrogation signal, each of the phase changers including a

switch coupled between the antenna and a stub ~~[having a length other than a wavelength of the interrogation signal]~~

25. (Currently Amended) A method of radio frequency communication, the method comprising:

receiving a radio frequency interrogation signal from an interrogator;

phase modulating the interrogation signal according to an information code to produce a response signal having a substantially constant power level by alternately opening and closing a switch according to a modulating signal corresponding to the information code, the switch ~~being coupled between an antenna that transmits~~ returns the response signal and a stub ~~[that has a length other than a wavelength of the interrogation signal]~~; and transmitting returning the response signal.

26. (Previously Presented) The method of claim 25 wherein the stub ~~[that has a length other than a wavelength of the interrogation signal]~~ is a quarter-wavelength stub.

27. (Currently Amended) A method of radio frequency communication, the method comprising:

receiving a radio frequency interrogation signal from an interrogator;

phase modulating the interrogation signal according to an information code to produce a response signal having a substantially constant power level by producing a modulating signal corresponding to the information code, the modulating signal being comprising a variable voltage applied to a first terminal of a diode to phase modulate the interrogation signal and thereby produce the response signal; and

transmitting returning the response signal from an antenna coupled to a second terminal of the diode.

28. (Currently Amended) A method of radio frequency communication, the method comprising:

receiving a radio frequency interrogation signal from an interrogator;
phase modulating the interrogation signal according to an information code to produce a response signal having a substantially constant power level and containing a plurality of phases that are each different than a phase of the interrogation signal; and transmitting returning the response signal.

29. (New) A method of radio frequency communication, the method comprising:

receiving a radio frequency interrogation signal from an interrogator;
phase modulating the interrogation signal according to an information code to produce a response signal with a substantially constant power level, by producing a phase-modulating signal corresponding to the information code; and
returning the response signal.

30. (New) A radio frequency transponder, comprising:
an antenna to receive an interrogation signal;
a memory that stores an information code; and
a phase modulator structured to produce a response signal of a substantially constant power level according to the information code, the response signal containing at least one phase in addition to a phase that is substantially identical to a phase of the interrogation signal.

31. (New) A radio frequency communication system, comprising:
an interrogator to transmit a radio frequency interrogation signal; and
a transponder to receive the interrogation signal and to return a response signal with a substantial constant power level, the transponder comprising:
a memory that stores an information code; and
a phase modulator structured to include in the response signal at least one phase in addition to a phase that is substantially identical to a phase of the interrogation signal.